

STERRAD® Service Access Key

AutoTest Guide

 ADVANCED STERILIZATION PRODUCTS®
a *Johnson & Johnson* company
Division of Ethicon, Inc.

TS-50026-0-002

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Manufacturer:



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Introduction

The Service Access key is used with AutoTest to allow ASP Field Service Engineers to gain access to the service mode or “deep edit” of the STERRAD® 100S Sterilizer. The software detects the presence of the service key. Use of this key is restricted to ASP Field Service personnel only. It is not available to customers.

In order for the service key to work on all of the Block 2.0 STERRAD 100S Systems, the jumper J1 on the connector distribution PWA board should not be installed.

This publication shows you how to use the Service Access Key and provides step-by-step information on using AutoTest. AutoTest on the STERRAD 100S Sterilizer is substantially different from the STERRAD 100 Sterilizer.

This guide is designed to be used with the *STERRAD 100/100S Service Guide*. You must follow all field service safety procedures, detailed in the *STERRAD 100/100S Service Guide* when using the Service Access Key.

Entering the Service or “Deep Edit” Mode

- If START and OPEN are pressed simultaneously in any menu, while in the deep edit mode, the system returns to the main edit level of the edit mode.
- If START and CANCEL are pressed simultaneously while in *any* menu, at the Main edit level, the system returns to normal processing mode, in the idle state, and prints a system status report.
- REMOVE SERVICE ACCESS KEY is printed if you have not removed the key prior to exiting the editor and returning to normal process mode.
- If CLOSE is pressed during any AutoTest top level display, and at least one test has been completed, the AutoTest final report is printed. Tests that have been completed, are designated “complete,” otherwise the designation is “not complete.” Once this report is printed, and AutoTest has exited to the main system software, test completion status is reset for all tests to “not complete.”

✓Note: Prior to using the service access key, make sure jumper J1 on the connector distribution PWA (inside the control enclosure) is **not** installed.

1. Simultaneously press START and OPEN. You enter the main edit mode.
2. Connect the service access key to the ribbon cable attached to the J2 connector on the CPU PWA.
3. Simultaneously press START and OPEN for approximately 2 seconds while in the system enters the “Deep” editor. The function in the “Deep” editor are as follows:
 - Set the Total Machine Cycles
 - PM Main Menu
 - » Turn the PM warning (both levels) on or off
 - » Reset the PM warning counter for level 1
 - » Reset the PM warning counter for level 2
 - » Set the service interval for PM1 Cycle Duration
 - » Set the service interval for PM2 Cycle Duration
 - » Set the service interval for PM1 Months Duration
 - » Set the service interval for PM2 Months Duration
 - Print or Clear the Cassette Log
 - Record the Machine Serial Number
 - Enable a one time only short test cycle
 - Enter the AutoTest sub-system

Total Machine Cycles Menu

The first menu in the Deep Menu is the Total Machine Cycle menu.

TOTAL MACH. CYCL. XXXXX
OPEN(chng)-CANCEL(accept)

Press CLOSE to move the cursor to each digit in turn, starting at the rightmost digit, moving left, and wrapping back to the rightmost digit. Pressing OPEN increments the digit by 1 ranging from 0 to 9. When the total machine cycles are reset to zero (via incrementing one more than 65535), then the machine is reset by clearing system variables.

Press CANCEL to transfer to the next menu.

Planned Maintenance Main Menu

**PM WARNING = ON (or) OFF OPEN(chng)-
CANCEL(next)**

ON or OFF indicates the state of the Planned Maintenance warning feature. When this feature has been turned OFF, no messages related to performing planned maintenance are generated. Press OPEN DOOR to toggle the warning between ON and OFF. Press CANCEL to accept the choice displayed.

If the warning feature is ON, pressing CANCEL gives different options for selecting the PM interval. If this feature is OFF, pressing CANCEL transfers you to the Serial Number Edit Menu.

The PM warning is set to ON by default, whenever a loss of battery power occurs or the number of total machine cycle is reset to zero.

PM Level 1 (2) Edit Menu

The following is displayed:

**PM Y (or) N; NEXT PM = XXXX L(X)
OPEN(reset)-CANCEL(next)**

Y is yes PM was done. N is no PM has not been done. XXXX is the number of cycles before the PM is due, or the month in which the PM is due and (X) is level 1 or level 2. If PM is not due on the basis of either months or cycles, XXXX is in cycles. If both months and cycles are due, or both are past due, XXXX is also in cycles. XXXX is displayed in months, if months are due, and cycles are not due. Months are also displayed if months are past due, while cycles are less than past due. If the number shown is a negative number, then it is the number of cycles past due.

The Y changes to N automatically when the a PM is due. The level of PM due is indicated on the print-out after a cycle has been completed, and on the display in the idle state. You can reset the N to Y by pressing OPEN DOOR; XXXX automatically changes to the level 1 or 2 PM service interval in cycles. If no PM is due, then the cycles until the next level 1 or 2 PM are displayed.

Press OPEN DOOR to store the data, the total machine cycles, and print the information while exiting the Edit mode. The maximum storage capacity 10 PM services. When the 11th PM service record is entered, the system deletes the oldest record, re-sequences the existing records and enters the new record in the 10th position. The system prints the PM service history when it is updated:

Pressing CANCEL transfers you to the PM Level 1 Cycles Interval menu.

PM Level 1 Cycles Interval

The following is displayed:

PM 1 CYCLES = XXXX
OPEN(chng)-CLOSE(accept)

XXXX is the current Level 1 PM cycles service interval.

Press CLOSE to move the cursor to each digit in turn, starting at the rightmost digit, moving left, and wrapping back to the rightmost digit.

Press OPEN to increment the digit by 1 ranging from 0 to 9. The Level 1 PM cycles can be programmed to a value between 500 and 2000 cycles, with a default value of 1500 cycles.

Pressing CANCEL transfers you to the PM Level 2 Cycles Interval menu.

PM Level 2 Cycles Interval

The following is displayed:

PM 2 CYCLES = XXXX
OPEN(chng)-CLOSE(accept)

XXXX is the default PM level 2 cycles service interval. The default PM level 2 cycles interval is 2 times that of the PM level 1 cycles interval.

Press OPEN to change the displayed interval to the next available option, based on the PM Level 1 duration. The PM Level 2 interval can be only 1, 2 or 3 times the PM Level 1 duration, with a range of 500 to 4000 cycles. A duration outside the valid range reverts to the default values.

Pressing CANCEL transfers you to the PM Level 1 Months Interval menu.

PM Level 1 Months Interval

The following is displayed:

PM 1 MONTHS =	XX
OPEN(chng)-CLOSE(accept)	

XX is the current PM Level 1 service interval in months.

Press CLOSE to move the cursor to each digit in turn. Pressing OPEN increments the digit by 1 ranging from 0 to 9. The interval type months can be programmed to a value between 4 and 12 months, with a default value of 6 months.

Press CANCEL to transfer to the PM Level 2 Months Interval menu.

PM Level 2 Months Interval

The following is displayed:

PM 2 MONTHS =	XX
OPEN(chng)-CLOSE(accept)	

XX is the default PM level 2 months service interval. The default PM level 2 months interval is twice that of the PM level 1 months interval.

Press OPEN to change the displayed interval to the next available option, based on the PM level 1 duration. The PM level 2 interval can be only 1, 2, or 3 times the PM level 1 duration, within a range of 4 to 24 months. A duration outside the valid range reverts to the default values.

Press CANCEL to transfer to the Cassette Log Menu.

Cassette Error Log Menu

The Cassette Error log allows you to troubleshoot cassette/injector pump problems by providing statistics of barcode reading errors accumulated over time. The Cassette Log following is displayed:

CASSETTE LOG	PRINT
OPEN(chng)-CLOSE(accept)	

Press OPEN to toggle the display between “PRINT” and “CLEAR.”

Pressing CANCEL on either menu transfers you to the Serial Number Edit menu. Pressing CLOSE while CLEAR is displayed clears the cassette log, which is maintained in battery backed-up memory. The cassette log is cleared when total machine cycles are reset to zero and at initial installation of the software.

Pressing CLOSE while PRINT is displayed, prints the Error Log Report containing information accumulated since the cassette log was last cleared. This information is as follows:

- Sterilizer information, date and time.
- Total number of cassettes accepted
- Total number of cassettes rejected
- Cassettes rejected because of a barcode parity error.
- Cassettes rejected because they were of a type unacceptable for the machine
- Cassettes rejected because of current system date is past date of cassette
- Cassettes rejected because inserted incorrectly.
- Cassettes rejected because of long white space detected before reading 12 barcode bars.
- Cassettes rejected because of black space detected that is too long for a barcode bar.
- Cassettes rejected because of black space detected that is too short for a barcode bar (possibly a smudge)
- Number of times the main cassette handling “default” routine was executed.

- Number of times the main cassette 10 msec interrupt “default” handler was executed.

Serial Number Edit Menu

The following is displayed:

SERIAL NUMBER = XXXXXX
OPEN(chng)-CLOSE(accept)

XXXXXX is the sterilizer serial number.

Press OPEN or CLOSE to enter or edit the serial number in the same manner as described for the total machine cycles menu. The serial number can have any value in the range of 0 to 999999. If CANCEL is pressed, the system transfers from the Serial Number Edit menu to the Test Cycle Menu.

Test Cycle Menu

The following is displayed:

TEST CYCLE DISABLED
OPEN(chng)-CLOSE(accept)

or

TEST CYCLE ENABLED
OPEN(chng)-CLOSE(accept)

Press OPEN to toggle the display indicating the status of the test cycle.

Once enabled, the test cycle remains enabled for one cycle only. If that cycle is autorestarted (STERRAD 100 Sterilizers only), the autorestarted cycle continues the test cycle. If the test cycle is canceled, it reverts to the disabled status. For STERRAD 100 Sterilizers, the test cycle is a special short cycle with a diffusion time of 2 minutes instead of 44 minutes. For STERRAD 100S Sterilizers, the test cycle is the same as the first half of the short cycle, with final vent occurring after the first plasma stage. The last part of the test cycle printout is in red, and has the message ”FOR TESTING PURPOSES ONLY!!”

Pressing CLOSE, or CANCEL transfers you to the Execute AutoTest menu.

Execute AutoTest

The following is displayed:

**EXECUTE AUTOTEST
w/OPEN Next w/CANCEL**

If OPEN is pressed, and the service access key is in place, the system transfers you to the AutoTest subsystem as shown in the next display. If CANCEL is pressed the system transfers to the Total Machine Cycles menu.

**AUTOTEST SETUP
PLEASE WAIT...**

Outputs

Outputs for the Edit mode are LCD messages and updated date, time, PM data, serial number, and total machine cycles information. This is part of the information that the system stores in its battery backed RAM. This information is retained even if the machine is turned off so it is only updated when the machine is first installed at the customer site.

Overview of AutoTest

AutoTest has the following sections:

- AutoTest Editor
- Printer Test
- Analog Test
- RF/Leak Test
- Cassette Adjustment Test
- Outpanel Test
- Sensor Test
- Injection/Pneumatics (INJPNEU) Test

- Throttle/Heater Test
- Door Test
- Vacuum Test
- Injection Test
- Slot Test

AutoTest Top Level Menu

AUTOTEST EDITOR w/START
Next(CANCEL)-Exit(CLOSE)

PRINTER TEST w/START
Next(CANCEL)-Exit(CLOSE)

ANALOG TEST w/START
Next(CANCEL)-Exit(CLOSE)

RF/LEAK TEST w/START
Next(CANCEL)-Exit(CLOSE)

(ANA)CASS. TEST w/START
Next(CANCEL)-Exit(CLOSE)

OUTPANEL TEST w/START
Next(CANCEL)-Exit(CLOSE)

SENSOR TEST w/START
Next(CANCEL)-Exit(CLOSE)

INJPNEU TEST w/START
Next(CANCEL)-Exit(CLOSE)

THROTTLE/HEATER w/START
Next(CANCEL)-Exit(CLOSE)

DOOR TEST w/START
Next(CANCEL)-Exit(CLOSE)

SLOT TEST w/START
Next(CANCEL)-Exit(CLOSE)

VACUUM TEST w/START
Next(CANCEL)-Exit(CLOSE)

INJECTION TEST w/START
Next(CANCEL)-Exit(CLOSE)

SLOT TEST w/START
Next(CANCEL)-Exit(CLOSE)

CANCEL returns to the AutoTest Editor.

AutoTest Editor

The AutoTest editor allows you to enter values for the length of the plasma phase of the RF/Leak Test, the plasma pressure during the RF/Leak Test, and the length of the barcode on the cassette to be used for the Cassette Test. The autotest editor is entered by pressing START on the following AutoTest top level display:

AUTOTEST EDITOR w/START
Next(CANCEL)-Exit(CLOSE)

RF PLAS T(min)= XX.X
OPEN(chng)-CLOSE(accept)

RF PLS P(mtorr)= XXX
OPEN(chng)-CLOSE(accept)

BC LENGTH(mm)= XX.X
OPEN(chng)-CLOSE(accept)

EDIT RF PLASMA TIME
w/CANCEL, Exit w/CLOSE

Press CANCEL to return to the RF Plasma Time edit display.

Press CLOSE to return to the AutoTest Top Level Menu.

Printer Test

Press START to begin the printer test.

PRINTER TEST w/START
Next(CANCEL)-Exit(CLOSE)

The printer test prints a report header and the character set in red and then in black.

Analog Test

Press START to begin the analog test.

ANALOG TEST w/START
Next(CANCEL)-Exit(CLOSE)

This procedure allows you to test all the channels of the analog input assembly, and to save observed voltages from each channel for a printed report.

Press CANCEL to transfer to the next analog channel, and OPEN to transfer to the previous channel. Pressing CLOSE exits the Analog test, prints the Analog test report, and returns to the top level AutoTest menu. Press START for a particular channel. The current input voltage for that channel is displayed.

When the LCD displays voltages for each analog channel, press OPEN to save the displayed voltage for the Analog test report. OPEN may be pressed more than once, but only the last voltage saved appears in the report. Press CANCEL on the voltage display level to transfer to the Analog top level menu for the *next* channel. Press CLOSE on the voltage display level to exit the Analog test, print the Analog test report, and return to the top level AutoTest menu.

✓ Note: *Unless at least one voltage value has been saved, the Analog test report is not printed.*

Analog Test Displays

CHAN #0 CHAMBER
PRESSURE INPUT w/START or Next
w/CANCEL

PRESSURE X.XXX V.,
OPEN(save)-CANCEL(next)

CHAN #7 HIGH PRESS CHNL
w/START or Next w/CANCEL

X.XXX V., HIGH PRESSURE
OPEN(save)-CANCEL(next)

CHAN #1 RF REFLECT POWER
w/START or Next w/CANCEL

X.XXX V., REFLECT POWER
OPEN(save)-CANCEL(next)

CHAN #2 RF DEL. POWER
w/START or Next w/CANCEL

X.XXX V., DELIVER. POWER
OPEN(save)-CANCEL(next)

**CHAN #3 FLOATING INPUT
w/START or Next w/CANCEL**

**X.XXX V., FLOATING INPUT
OPEN(save)-CANCEL(next)**

**CHAN #4 FLOATING INPUT
w/START or Next w/CANCEL**

**X.XXX V., FLOATING INPUT
OPEN(save)-CANCEL(next)**

**CHAN #5 DOOR TEMPERATURE
w/START or Next w/CANCEL**

**X.XXX V., DOOR TEMP.
OPEN(save)-CANCEL(next)**

**CHAN #6 CHAMBER TEMP.
w/START or Next w/CANCEL**

**X.XXX V., CHAMBER TEMP.
OPEN(save)-CANCEL(next)**

If CANCEL is pressed on the Channel 6 display, the following is displayed:

CHAN #0 w/CANCEL
Exit w/CLOSE

If CANCEL is pressed on the above display, the LCD returns to the Channel 0 display. Pressing CLOSE exits the Analog test, and prints the Analog test report. If a voltage for a particular channel has not been saved, “not saved” is printed for that channel in place of a voltage value.

RF Check-Leak Back Test

The RF/Leak test is an automated procedure that exercises the ability of the system to create a vacuum and produce a gas plasma inside the chamber. It also determines if there are any gross leaks in the system

The RF/Leak test has several possible processing options: the RF Plasma time, which you enter in the AutoTest Editor, determines the duration of the RF Check Test. If this time is greater than 0.0 minutes, both the RF Check and Leak Back tests are performed. If you have entered an RF Plasma Time of 0.0 minutes in the AutoTest editor, only the Leak Back test is performed.

The RF Plasma pressure, entered in the AutoTest Editor, determines the limits to which the chamber pressure is controlled during the RF Check test. Also, the RF Check test can be performed with peroxide injection or without, depending on your input, and insertion of a cassette.

The RF/Leak test begins when START is pressed on the following AutoTest top level menu display:

RF/LEAK TEST w/START
Next(CANCEL)-Exit(CLOSE)

After START is pressed, if the RF Plasma time has been set to a value other than 0.0 minutes, the following is displayed:

INJECT BEFORE RF_CHECK?
YES(START)-NO(CANCEL)

Press START to cause the RF Check Test to include a 6 minute injection period, prior to lighting a plasma. In addition, the RF Plasma time is set to 15 minutes or the RF plasma time you entered, whichever is *greater*. (This is to insure that the peroxide injected into the chamber is burned up in the plasma of the RF Check test). From this point, the RF/Leak test proceeds with injection.

Press CANCEL to cause the RF Check Test to proceed without a 6 minute injection period. From this point, the RF/Leak test proceeds without injection.

After pressing CLOSE or CANCEL, the chamber door is closed prior to initiating the RF Check test,

If the door fails to close, press CLOSE to return to the AutoTest top level display for the RF Check/Leak test.

Pressing CLOSE exits the RF Check/Leak back test, and returns to the AutoTest top level menu. CLOSE has this same functionality throughout the RF Check/Leak Back test *except* during the RF Check portion of the test *if* an injection period has preceded the RF Check test. While the RF/Leak test is exiting, the following is displayed:

**EXITING RF/LEAK TEST
PLEASE WAIT...**

RF Check Test With Injection

After the door is closed, if there is no cassette in the sterilizer, the following is displayed, otherwise it continues the test, using whatever cassette cell is positioned over the injector needles:

**INSERT CASSETTE
Exit w/CLOSE**

Pressing CLOSE exits the RF/Leak test as described above.

Once a cassette is in place, both the vaporizer heater and the vacuum pump are turned on. The vacuum pump continues to run until the chamber pressure reaches 300 mTorr. During this pump down, the following is displayed: (Pressure units of Torr or Pascals are user selectable.)

**PUMP DOWN TO XXX mtorr
PRESS= XXXXX**

At 300 mTorr (STERRAD 100 Sterilizer) or 400 mTorr (STERRAD 100S Sterilizer), the throttle valve closes. Once the throttle valve is closed, the vacuum pump is turned off, and the injector cam extends, piercing the cassette cell for 1 minute (STERRAD 100 Sterilizer) or 30 seconds (STERRAD 100S Sterilizer). When the cam extend time has expired, the cam retracts and the cassette is indexed to the next cell. The injection period continues until a total time of 6 minutes has elapsed. The vaporizer heater remains on during the 6 minute injection period, and the following information is displayed. The chamber pressure (XXXXX), and time spent in the injection period (X.X M) on LCD line 2 is continually updated. (Pressure units of Torr or Pascals are user selectable.).

VACRF TEST INJECT 6.0 M
PRESS= XXXXXX X.X M

✓ Note: *There are no minimum or maximum chamber pressure requirements for this injection period, and no empty cassette cells check is performed.*

At 6 minutes, prior to continuing with the RF Check test, the chamber pressure is saved for inclusion in the RF Check test report.

After completion of the 6 minute injection period, the vaporizer heater is turned off, and the RF Check test continues unless the plasma cannot be lit after 5 attempts. If the Plasma has not been lit after 5 attempts, a 10 minute cancel cycle is run, an error message is printed, and the system returns to normal processing mode in the idle state.

RF Check Test Without Injection

Prior to beginning pump down for the RF Check test, the chamber and door heaters are turned off, and the system temperature control is suspended for the duration of the RF Check test (system temperature control is resumed at the start of the Leak Back test). After turning off the heaters, the throttle valve is opened, and the vacuum pump turned on. The vacuum pump runs continuously during the RF Check test, and chamber pressure is regulated by manipulating the throttle valve or solenoid throttle valve. While the chamber pressure is decreasing to the RF plasma pressure, the following is displayed,

PUMP DOWN TO XXX mtorr
PRESS= XXXXX

XXX is the RF plasma pressure entered in the AutoTest editor, and **XXXXXX** is the chamber pressure. (Pressure units of Torr or Pascals are user selectable.)

Once the chamber pressure reaches the desired range (RF plasma pressure \pm 25 mTorr), the system turns on the RF power supply and, after 700 milliseconds, turns on the RF amplifier to light the plasma.

After the RF power and amp are turned on, the RF delivered power level is checked to determine if plasma is lit. If the RF delivered power level is lower than 365 Watts, then it is assumed that plasma is not lit. In this case, the RF power and amp are turned off, and the system waits 30 seconds before attempting to light plasma again. Up to 4 retries are allowed; if plasma is not then lit, the RF Check Leak Back test exits, prints an error message, and returns to the AutoTest top level menu.

If the plasma is successfully lit, the following is displayed:

DEL=XXXX RFL=XX	XX.XM
PRESS= XXXXXX	YY.YM

XXXX is the RF delivered power in mVolts, **XX** is the RF reflected power in mVolts, **XX.X** is the RF plasma time, **XXXXXX** is the chamber pressure (pressure units of Torr or Pascals are user selectable), and **YY.Y** is the amount of time elapsed in the RF Check test. All the fields of this display, except the RF plasma time, are continuously updated during the RF Check test. During the test the vacuum pump is continuously running, and the chamber pressure is controlled to the RF plasma pressure by manipulation of the throttle valve or solenoid throttle valve.

Thirty seconds after the plasma is lit, and at 5 minute intervals during the RF Check test, and just before exiting the RF Check test, the values of the RF delivered power, and the RF reflected power are saved for inclusion in the RF Check test report.

If the RF reflected power exceeds 50 Watts (400 mVolts) at anytime during the RF Check test, a 10 minute cancel cycle is run, after which the error messages are printed, and the system returns to normal processing mode in the Idle state.

When the elapsed time in the RF Check equals the RF Plasma time, the system automatically starts the Leak Back test .

Leak Back Test

If the RF Check test has not preceded the Leak Back test, and the chamber door is open, the following is displayed while it is being closed:

**DOOR CLOSES
AUTOMATICALLY**

Once the door is closed, the vacuum pump is turned on, and the following is displayed while the chamber pressure is being pumped down to the RF Plasma Pressure. **XXX** is the RF Plasma pressure, and **XXXXXX** is the chamber pressure. (Pressure units of Torr or Pascals are user selectable.)

**PUMP DOWN TO XXX mtorr
PRESS = XXXXX**

Once the chamber pressure reaches the RF Plasma pressure (or if the RF Check test has preceded the Leak Back test), the throttle valve is closed, and the vacuum pump, RF amp, and RF power is turned off. The following is displayed while the chamber pressure is monitored for 5 minutes:

**MONITOR PRESS FOR 5 MIN
P0 = XXX P = YYY X MIN**

XXX is the chamber pressure when the vacuum pump was turned off, **YYY** is the monitored chamber pressure, and **X** is the elapsed time in the Leak Back test. The monitored chamber pressure, and the elapsed time are continuously updated during the Leak Back test. After 5 minutes has elapsed in the Leak Back test, the results of the Leak Back test are displayed, while the RF Check and Leak Back test reports are printing.

**PRINTING RF/LEAK RESULTS
P0=XXX P5=YYYY LK=X.X**

XXX is the chamber pressure when the vacuum pump was turned off, **YYYY** is the chamber pressure after 5 minutes, and **X.X** is the leak rate in mtorr/min = (YYY - XXX)/5.

Following completion of the Leak Back Test, reports for the RF Check test (if performed), and for the Leak Back test are printed.

The printed injection pressure is recorded after the 6 minute injection period, prior to pump down for the RF Check test.

Cassette Test (Analog Injector Pump Only)

The goal of the Cassette test is the proper adjustment of the sensitivity of the cassette sensor, and the speed of the cassette motor, so that the barcode bars on the cassette is reliably detected. The test has 2 phases, a cassette adjustment phase and an adjustment verification phase:

Important Note: The Cassette test should be used only for the analog control mechanism. It does not apply to machines with the digital fiber-optic mechanism. The test is included because some machines in the field may still have the analog control. The digital control mechanism is adjusted independent of the Z180 software.

- During the cassette adjustment phase the cassette is continuously moved past the sensor, and data from the cassette sensor monitored and displayed. Only the data recorded on the inward pass of the cassette is used, since the speed of the cassette is actually slightly different in the outward direction for a given motor setting. Sensor data is recorded on a 1 millisecond basis. During this phase, you can adjust both the cassette sensor sensitivity and the cassette motor speed and observe the results in the displayed data.
- When the sensor/speed adjustments are satisfactory, you can initiate the adjustment verification phase. During this phase values for the cassette speed, and minimum barcode white space, are calculated and compared to acceptable ranges for these values, for each of 10 passes of the cassette inward past the cassette sensor. Successful completion of the cassette test requires that the values fall within acceptable ranges for all 10 passes of the cassette.

✓ Note: *In order for the Cassette Test to work properly, the cassette guide rails in the injector pump, and the cassette roller (where it contacts the cassette) must be cleaned of any peroxide stabilizer residue. Stabilizer residue can cause the cassette to “stick” intermittently, and give highly variable speed readings.*

Initial Display

The Cassette test is entered by pressing START on the AutoTest top level menu display:

(ANA) CASS TEST w/START
Next(CANCEL)-Exit(CLOSE)

If there is a cassette present in the Injector pump, it ejects towards the front panel. As it is being ejected, the following is displayed:

(ANA) CASS TEST SETUP
WAIT FOR CASSETTE EJECT

If the cassette does not clear the cassette sensor after disengaging from the cassette motor roller, the following is displayed until the cassette is removed.

PLEASE REMOVE CASSETTE

Cassette Adjustment Phase

You are prompted to insert a cassette as follows:

INSERT CASSETTE

Once inserted, the cassette is moved continuously inward and outward past the cassette sensor. Only data collected on the inward pass of the cassette is used, and once the cassette has completed one inward pass, the LCD display changes to the following:

BC minW = XX minB= XX
SL AVR =XXX minB = XX

The first line of the display contains barcode data, and the second line contains slot data. The value for BC minW is only calculated if the SL AVR (cassette speed) is 500 ± 5 :

- **BC minW:** Minimum number of 1 millisecond interrupts recorded for the cassette sensor reading a barcode white space (minimum white).
- **BC minB:** Minimum number of 1 millisecond interrupts recorded for the cassette sensor reading a barcode bar (barcode minimum black).
- **SL AVR:** Average number of 1 millisecond interrupts from the beginning of an injection slot bar to the end of the following white space or approximately 15 mm (cassette speed).
- **SL minB:** Minimum number of 1 millisecond interrupts recorded for the cassette sensor reading an injection slot bar (slot minimum black)

During this phase of the Cassette test, OPEN toggles between the previous LCD display and the following:

MINWL = XX	MINWH = XX
MID PT = XX	MINW = XX

Both lines of this display contain barcode data. The following values are only calculated if the SL AVR (cassette speed) is 500 ± 5 .

- **MINWL:** Lowest minimum white (barcode) value seen for all passes of the cassette
- **MINWH:** Highest minimum white (barcode) value seen for all passes of the cassette
- **MID PT:** $(\text{MINWL} + \text{MINWH}) / 2$
- **MINW:** Minimum white (barcode) value for the latest inward cassette pass

Press START to begin the adjustment verification phase of the cassette test.

Adjustment Verification Phase

The initial display of the adjustment verification phase is shown below:

CALCULATING CASSETTE SPEED + SLOT PARAMETERS

After the cassette completes one successful (barcode minimum white, and cassette speed are within acceptable limits) pass by the cassette sensor, the display changes to the following:

**CASSETTE ADJ IS CORRECT
CHECK XX OF 10 WAIT!!**

XX increments from 1 to 10 for each consecutive successful inward pass of the cassette past the cassette sensor. If 10 consecutive successful passes are completed, the cassette motor stops and the report is printed.

This report is **only** printed if 10 consecutive successful passes are completed. After printing completes, the Cassette test exit proceeds.

If on any of the 10 passes, the barcode minimum white, or cassette speed are outside of acceptable limits, an error message displays on the LCD until completion of 4 inward passes of the cassette (or until OPEN is pressed), and then returns to the cassette adjustment phase.

If the cassette speed is outside of the range of 500 ± 5 , the following error message displays:

**SPEED IS INCORRECT (XXX)
SET AVR TO 500 (+/- 5)**

XXX is the measured cassette speed.

If the barcode minimum white of the current cassette pass is outside the range of MID PT \pm 1, the following error message displays:

**minW IS INCORRECT (WW)
SET minW TO XX (+/- 1)**

WW is the barcode minimum white calculated for the current cassette pass, and **XX** is the MID PT.

If the slot bar minimum black of the current cassette pass is less than 30, the following error message displays:

**SLOT IS INCORRECT (XX)
SET SL minB > 30**

XX is the slot minimum black calculated for the current cassette pass.

Exit Cassette Test

The cassette test automatically exits if there are 10 consecutive successful passes during the adjustment verification phase, otherwise you can terminate the cassette test at any time by pressing CANCEL or CLOSE. If the cassette test exits automatically after successful adjustment the following message is displayed.

**SUCCESSFUL CASSETTE ADJ
WAIT FOR CASSETTE EJECT**

If the cassette test is terminated, the following is displayed.

**EXITING (ANA) CASS TEST
WAIT FOR CASSETTE EJECT**

The cassette is returned via the front panel, and if the cassette does not clear the cassette sensor after disengaging from the cassette motor roller the following is displayed.

PLEASE REMOVE CASSETTE

Once the cassette clears the cassette sensor or is removed, the initial cassette test is displayed.

Outpanel Test

The purpose of the Outpanel test is to test the operation of the front panel lights. There are six different lights: ALARM, VACUUM, INJECTION, DIFFUSION, PLASMA, and VENT.

The Outpanel test is executed by pressing START while the LCD is displaying the following AutoTest top level menu:

**OUTPANEL TEST w/START
Next(CANCEL)-Exit(CLOSE)**

Press START. The following is displayed, and all the lights are off initially:

**ON/OFF LIGHTS w/START
Exit w/CLOSE**

By repeatedly pressing START, you can toggle the lights on and off. All lights are turned on or off simultaneously.

Pressing CLOSE turns off all the lights, and prints the Outpanel test report.

Sensor Test

The sensor test is used to verify that all of the various sensors can be read by the processor, and to check the sensor wiring on the machine. The following sensors must be checked and an audible alarm is sounded when the sensors are activated:

- Door top sensor
- Door center sensor
- Door bottom sensor
- Cassette sensor
- Chute sensor
- Box sensor

- Whitman vacuum sensor (Block 1.8 sterilizers)
- SMC vacuum sensor (Block 2.0 sterilizers.)

The Sensor test is executed by pressing START while the following AutoTest top level menu is displayed.

SENSOR TEST w/START
Next(CANCEL)-Exit(CLOSE)

There are 2 LCD displays for each of the above sensors, except the vacuum sensor, which has 3. The Vacuum sensor has an initial display indicating the type of Vacuum sensor to be tested. Sterilizers have either a Whitman vacuum switch (Block 1.8 sterilizers), or an SMC vacuum switch (Block 2.0 sterilizers).

Following are the displays for all the sensors, except the vacuum sensor. The displays are shown activated and not activated. In addition, a continuous series of beeps sound when each sensor is activated. Press CANCEL to transfer to the next sensor, pressing OPEN transfers to the previous sensor. Pressing CLOSE exits the Sensor test, prints the Sensor test report, and returns to the AutoTest top level menu. At least one sensor must have changed its state for the report to print.

✓ Note: *This test requires that each sensor change state in order to be complete. For example, the door bottom sensor must indicate a door blocked condition and a door not blocked condition during the test. You can use CANCEL-OPEN, CANCEL-CLOSE combinations to open and close the chamber door to block and unblock the various door sensors.*

OPEN goes to SMC Vacuum Switch. CANCEL goes to Whitman Vacuum Switch.

BLOCK DOOR TOP SENSOR
Next w/CANCEL

DOOR TOP SENSOR BLOCKED
Next w/CANCEL

BLOCK DOOR CENTER
Next w/CANCEL

DOOR CENTER BLOCKED
Next w/CANCEL

BLOCK DOOR BOTTOM
Next w/CANCEL

DOOR BOTTOM BLOCKED
Next w/CANCEL

BLOCK CASSETTE SENSOR
Next w/CANCEL

CASSETTE SENSOR BLOCKED
Next w/CANCEL

TURN CHUTE SWITCH ON
Next w/CANCEL

CHUTE SWITCH ON
Next w/CANCEL

TURN BOX SWITCH ON
Next w/CANCEL

BOX SWITCH ON
Next w/CANCEL

Both the Whitman and SMC vacuum switch menus have initial displays on which you must press START to execute the actual test displays. This is to allow you to select the appropriate tests for the vacuum switch model on the sterilizer being tested. Pressing CLOSE on any display of either Vacuum Switch test, exits the Sensor test, print the Sensor test report (if at least one sensor has changed state), and return to the AutoTest top level menu.

If CANCEL is pressed on the box switch display shown above, the following is displayed:

TST WHITMN VACSW w/START
Next w/CANCEL

If START is pressed in the initial Whitman vacuum switch display, and the vacuum switch indicates atmospheric pressure, the following is displayed, and a continuous series of beeps sound.

VACSW at ATM, DISCONNECT
Next w/CANCEL

If the vacuum switch does not indicate atmospheric pressure, or is disconnected, the following is displayed

RECONNECT VACUUM SWITCH
Next w/CANCEL

If CANCEL is pressed on any of the above Whitman vacuum switch displays, the initial display of the SMC vacuum switch test is as shown below.

TEST SMC VAC SW w/START
Next w/CANCEL

If START is pressed in the initial SMC vacuum switch displayed, and the vacuum switch indicates atmospheric pressure, the following is displayed, and a continuous series of beeps sound.

VACSW AT ATM. SET P1→P4
Next w/CANCEL

If the vacuum switch does not indicate atmospheric pressure, or is disconnected, the following is displayed:

Set P1&P3 =70, P2&P4 =15
Next w/CANCEL

✓ *Note: For the kPa switch, set P1 and P3 to 9; set P2 and P4 to 2. Proceed with the test.*

✓ *Note: If P1, P2, P3, or P4 on the SMC Vacuum switch are set to any number other than 0, a continuous series of beeps sound.*

If CANCEL is pressed on any of the above SMC vacuum switch displays, the following is displayed:

DOOR TOP SENSOR w/CANCEL
Exit w/CLOSE

Press CANCEL to return to the Door top sensor display. Press CLOSE to exit the Sensor test, and print the Sensor test report.

In the Sensor test report, all the sensors are listed with the results of the test. If the system has monitored a change in state (not activated to activated or vice versa), the sensor is designated as “exercised.” If the system has not monitored a change in state, the sensor is designated as “not exercised.”

✓ Note: In a given system, either one of the Whitman or the SMC vacuum switch is present. If only one of the vacuum switch tests is exercised, that test is included in the report. If both or none of the vacuum switch tests are exercised, both tests are included in the report. This also applies to the final AutoTest report.

INJPNEU Test

This test is used to verify the proper operation of the injector pump system. This includes testing the pawl, drive motor assembly, injection pneumatics, vaporizer heater, and the cassette door assembly. Each of the subsystems is exercised to ensure proper adjustment and operation.

Initially the following message is displayed:

INJPNEU TEST w/START
Next(CANCEL)-Exit(CLOSE)

If CANCEL is pressed, the initial Throttle/Heater test menu is displayed. If START is pressed, then the initial pawl test menu is displayed.

CLOSE can be pressed at any time during the INJPNEU tests, to return to this initial display.

Pawl Test

The initial Pawl test menu is illustrated below:

ON/OFF PAWL w/START
Next w/CANCEL

If START is pressed, a signal is sent to lift the pawl. If CANCEL is pressed, the initial Motor In test is displayed.

During the Pawl test, press START to toggle the LCD between the following displays, and concurrently toggle the pawl between the up position and down position.

RELEASE PAWL w/START
Next w/CANCEL

LIFT PAWL w/START
Next w/CANCEL

If CANCEL is pressed during either display, the initial Motor In test menu is displayed.

Motor In Test

The initial Motor In test menu is displayed as follows:

ON/OFF MOTOR IN w/START
Next w/CANCEL

If START is pressed, a signal is sent to activate the cassette motor in the inward direction. If CANCEL is pressed, the initial Motor out test message is displayed.

During the Motor In test, press START to toggle between the following displays, and concurrently toggle the motor status between stopped and activated in the inward direction.

MOTOR IN w/START
Next w/CANCEL

STOP MOTOR w/START
Next w/CANCEL

If CANCEL is pressed during either display, the initial Motor Out test menu is displayed.

Motor Out Test

The initial Motor Out test menu is displayed as follows:

ON/OFF MOTOR OUT w/START
Next w/CANCEL

If START is pressed, a signal is sent to activate the cassette motor in the Outward direction. If CANCEL is pressed, the initial Inject test message is displayed.

During the Motor Out test, press START to toggle the LCD between the following displays, and concurrently toggle the motor status between stopped and activated in the outward direction.

✓ Note: Before activating the motor outward, the motor is activated inwards briefly, to ensure that the pawl is free to lift.

MOTOR OUT w/START
Next w/CANCEL

STOP MOTOR w/START
Next w/CANCEL

If CANCEL is pressed during either display, the initial Inject test menu is displayed.

Inject Test

The initial display for the Inject Test is as follows:

ON/OFF INJECT w/START
Next w/CANCEL

If CANCEL is pressed the initial message for the Vaporizer Heater test described is displayed. If START is pressed, setup for the Injector begins.

If there is a cassette present in the Injector pump, it ejects towards the front panel. As it is being ejected, the following is displayed:

INJ. SOLENOID TEST SETUP
WAIT FOR CASSETTE EJECT

If the cassette does not clear the cassette sensor after disengaging from the cassette motor roller, the following is displayed until the cassette is removed.

PLEASE REMOVE CASSETTE

Once the existing cassette is removed, or if there was no existing cassette, the following is displayed:

POSITION EMPTY CASS SLOT
Continue w/START

You should then position a cassette in the injector pump so that a cassette slot is aligned with the injector. When START is pressed, a signal is sent to release the pawl and move the cassette motor outward for approximately 200 msec to firmly seat the pawl in the cassette slot ratchet. After approximately 200 msec the motor is stopped.

Once the inject test has be set up as described above, and the injector solenoid is not activated, the message on the left below is displayed on the LCD.

During the Inject test, press START to toggle between the following displays, and concurrently toggles the injector solenoid between off (cassette is released) and on (cassette is clamped).

INJECT ON w/START
Next w/CANCEL

INJECT OFF w/START
Next w/CANCEL

If CANCEL is pressed during either display, the injector solenoid is turned off, and the following is displayed as the cassette is ejected to the front panel.

EXITING INJECT TEST
WAIT FOR CASSETTE EJECT

If the cassette does not clear the cassette sensor after disengaging from the cassette motor roller, the following is displayed message on the LCD, until the cassette is removed.

PLEASE REMOVE CASSETTE

Once the cassette is removed, the initial Vaporizer Heater test menu is displayed.

Vaporizer Heater Test

The initial display for the vaporizer heater test is as follows:

**ON/OFF VAPORIZER HEATER
w/START or Next w/CANCEL**

If CANCEL is pressed, the heater is turned off, and the initial message for the Chamber Door test, is displayed. If START is pressed, the vaporizer heater is turned on.

During the Vaporizer heater test, press START to toggle between the following displays, and concurrently toggles the Vaporizer heater status between on and off. When the vaporizer heater is on, a continuous series of beeps sound if this sensor is operational.

**VAPORIZER OFF w/START
Next w/CANCEL**

**VAPORIZER ON w/START
Next w/CANCEL**

If CANCEL is pressed on either of the above displays, the heater is turned off, and the initial message for the Chamber Door test is displayed

Chamber Door Test

The initial display for the cassette door test is shown below:

**OPEN/CLOSE CHAMBER DOOR
w/START or NEXT w/CANCEL**

If CANCEL is pressed, the initial message for the Cassette door test is displayed.

If START is pressed, the system checks the status of the chamber door, and opens or closes it as needed.

During the Chamber door test, press START to toggle between the following displays, and concurrently close the Chamber door, or open the Chamber door. If the door center sensor is activated before the door top sensor at any time while the door is closing, the door opens.

**OPEN CHAMBER DOOR
w/START or Next w/CANCEL**

**CLOSE CHAMBER DOOR
w/START or Next w/CANCEL**

If CANCEL is pressed on either of the above displays the initial message for the Cassette door test is displayed.

Cassette Door Test

The initial display for the cassette door test is as follows::

**OPEN/CLOSE CASSETTE DOOR
w/START or NEXT w/CANCEL**

If CANCEL is pressed, a signal is sent to close the cassette door, and the INJPNEU test exit message is displayed.

If START is pressed, a signal is sent to open the cassette door.

During the cassette door test, press START to open or close the cassette door.

**OPEN CASSETTE DOOR
w/START or Next w/CANCEL**

**CLOSE CASSETTE DOOR
w/START or Next w/CANCEL**

If CANCEL is pressed during either of the above displays, as signal is sent to close the Cassette door, and the INJPNEU test is displayed.

Pressing START during this display returns to the initial Pawl test display. Pressing CLOSE exits the INJPNEU test and prints the INJPNEU test report.

Exit INJPNEU Test

If CANCEL has been pressed during the cassette door test, the following message is displayed:

**ON/OFF PAWL w/CANCEL
Exit w/CLOSE**

If CANCEL is pressed, the initial message for the pawl test is displayed. If CLOSE is pressed, the INJPNEU test report is printed, and the system returns to the AutoTest top level menu.

In the INJPNEU test report, all the tests are listed with the results of each test. If a test was performed, “PASS____ FAIL____” is printed to the right of the test, and you should indicate whether or not the test passed. If the test was not performed, “not exercised” is printed to the right of the test.

Throttle/Heater Test

The Throttle/Heater test allows you to test the operation of the throttle assembly, chamber heater, door heater, oil switch, and cassette switch.

The Throttle/Heater test is executed by pressing START while the following AutoTest top level menu is displayed:

**THROTTLE/HEATER w/START
Next(CANCEL) Exit(CLOSE)**

Pressing START transfers to the Heater test.

Heater Test

The heater test is initialized by turning off the chamber and door heaters, suspending system temperature control. The initial LCD display is shown on the left below.

HEATER ON w/START
Next w/CANCEL

During the heater test, START toggles between the 2 displays shown below while concurrently enabling temperature control, and suspending temperature control and turning off the heaters.

HEAT OFF w/START AX.XXXV
OPEN(save)-CANCEL(next)

In the field **AX.XXXV** A represents “C” for chamber or “D” for door. The LCD toggles every 3 seconds between the chamber and door temperatures. Therefore **CX.XXXV** represents the chamber temperature voltage and **DX.XXXV** represents the door temperature voltage.

When OPEN is pressed while **CX.XXXV** is displayed, the present *chamber* temperature voltage is saved. When OPEN is pressed while **DX.XXXV** is displayed, the present *door* temperature voltage is saved. OPEN may be pressed multiple times, but only the latest saved door and chamber heater voltages are retained.

While the chamber and door heaters are turned on, temperature limit errors may occur. In that event, the chamber and door heaters are turned off, system temperature control suspended.

If the chamber temperature exceeds 4.000 Volts, the chamber temperature is too high, and the following error message is displayed.

CHAMBER TEMP TOO HIGH
Recover w/START

If the door temperature exceeds 4.000 Volts, the door temperature is too high, and the following error message is displayed.

DOOR TEMP TOO HIGH
Recover w/START

If the chamber temperature falls below 1.000 Volts, the chamber temperature sensor has failed, and the following error message is displayed.

CHAMBER SENSOR FAIL
Recover w/START

If the door temperature falls below 1.000 Volts, the chamber temperature sensor has failed, and the following error message is displayed.

DOOR SENSOR FAIL
Recover w/START

Pressing START on any of the above error displays returns to the display shown below:

HEATER ON w/START
Next w/CANCEL

Pressing CANCEL on any of the above error displays for the Heater test transfers to the initial display of the Stepper Motor test.

Pressing CLOSE on any of the above displays for the Heater test exits the Throttle/Heater test, prints the Throttle/Heater test report, and returns to the AutoTest top level menu.

Stepper Motor Test

The initial (and only) display of the Stepper motor test is as follows:

ON/OFF STEPPER w/START
Next w/CANCEL

Pressing CANCEL turns off the stepper motor and transfers to the initial display of the Oil Switch test. Press START to toggle the stepper motor on and off.

When the test is entered, the stepper motor is off. During the time that the Stepper motor is on, it alternates directions between opening and closing the throttle valve. It switches directions when the throttle valve open sensor indicates that the valve is fully open (change to close direction), and when the valve is fully closed (change to open direction).

Oil Switch Test

The Oil switch test is displayed as follows:

ON/OFF OIL SW w/START
Next w/CANCEL

Pressing CANCEL during this display transfers to the initial display of the Throttle/Heater exit. Pressing START during this display initiates the Oil switch test.

START toggles between the 2 displays shown below, and concurrently turns the Oil switch off and on.

Pressing CANCEL on either display turns off the Oil switch, and transfers to the initial display of the Throttle/Heater test,

OIL SWITCH ON w/START
Next w/CANCEL

OIL SWITCH OFF w/START
Next w/CANCEL

The Throttle/Heater exit display is shown below:

ON/OFF HEATER w/CANCEL
Exit w/CLOSE

Pressing START during this display transfers to the initial display of the Heater test..

Pressing CLOSE during this display (or during any of the displays of the Throttle/Heater test series), exits the Throttle/Heater test series, prints the Throttle/Heater test report, and transfers back to the AutoTest top level menu.

At least one of the Throttle/Heater tests must be completed for the report to print. The Heaters and Oil Switch “exercised” or “not exercised.” The Stepper Motor test (“THROTTLE OPEN” and “THROTTLE CLOSE”) either indicate “OK” (if the throttle open or closed sensors have been activated) or “not exercised.” The voltages for the Chamber and Door Heaters either indicate the voltage values or “not saved.”

Door Test

Press START during the following AutoTest top level display:

DOOR TEST w/START
Next(CANCEL)-Exit(CLOSE)

This procedure tests the proper operation of the chamber door assembly, including the door pneumatics and door sensors. It also tests the door safety feature, which ensures that if the door is blocked while closing for any reason, it automatically retracts.

If START is pressed on the above display, the system checks the door status. If the door is open (and the door sensors are correctly functioning), the following is displayed:

The letters BTC on the displays represent Door Bottom Sensor, Door Top Sensor, and Door Center Sensor respectively. The series of 0s and 1s indicate the respective sensor status: 0 = not blocked, 1 = blocked.

CLOSE DOOR w/START BTC
Exit w/CLOSE

If START is pressed during this display, the door closes. If the door is closed, (and the door sensors are correctly functioning), the following is displayed:

TOP & CENTER BLOCKED BTC
Open Door w/START

If START is pressed during this display, the door opens.

Pressing CLOSE or CANCEL at any time during the Door test, exits the Door test, prints the Door test report (if the door has been successfully opened or closed at least once), and return to the AutoTest top level menu display.

Closing the Door

Once START is pressed during the previous displays, the door begins closing, and the display changes:

DOOR IS CLOSING... BTC
Test Cent-Block Door XXX

While the door is closing you can test the door safety feature by manually blocking the progress of the door so that the door center sensor is activated before the door top sensor. If the system senses this condition correctly, display changes briefly to the first message shown below. Almost immediately after, the door safety feature should be activated: the second message is displayed, and the door changes direction from closing to opening.

OVER CENTER BLOCKED BTC
Clear Center Sensor XXX

DOOR IS BLOCKED BTC
OPENING DOOR... XXX

When the door completes opening, the starting menu is displayed.

If the progress of the door is not blocked while it is closing, the display continues to show the error message until the top sensor is activated, at which point the display changes to briefly to the message shown below, until the door center sensor is activated, at which time the “TOP & CENTER BLOCKED” message is displayed.

TOP SENSOR BLOCKED BTC
Center NOT Blocked XXX

The maximum time allowed for the door to close is approximately 15 seconds. If after 15 seconds, the door top sensor is blocked, but the door center sensor is not blocked the following is displayed:

CHK CENT. & AIR PRES BTC
Open Door w/START XXX

If after 15 seconds, neither the door top sensor or the door center sensor is blocked, the following is displayed:

**CHK TOP, CENT, & AIR BTC
COMPRSR Open w/START XXX**

Pressing START during either display opens the door.

Opening the Door

Once START is pressed during the “TOP & CENTER BLOCKED” display, the door begins opening, and the display changes to the following message, while the door is opening.

**DOOR IS OPENING... BTC
Exit w/CLOSE XXX**

The maximum time allowed to open the door is approximately 15 seconds. If the system senses that the door is open (door bottom sensor blocked, door top sensor and door center sensor not blocked) within this time period, the display changes to the starting menu.

If after 15 seconds of trying to open the door, the door bottom sensor is blocked, but either or both the door top sensor or the door center sensor is also blocked, the following is displayed.

**CHECK TOP & CENTER BTC
One or Both Blocked XXX**

If after 15 second of trying to open the door, the bottom sensor is *not* blocked, the following is displayed.

**CHECK BOTTOM SENSOR BTC
Is Not Blocked XXX**

If either of the above displays occur, you should check the functionality of the door sensors before proceeding. However, pressing START on any of the displays described in this section begins the close door process.

Door Test Report

Pressing CLOSE or CANCEL at any time during the Door test, exits the Door test, prints the Door test report, if the door has been opened or closed successfully at least once, and returns to the AutoTest top level menu display.

If the system has detected the door bottom sensor, door top sensor, and door center sensor, as blocked, not blocked, and not blocked, respectively after you have pressed START; “DOOR OPEN” is printed as “OK.” Otherwise it is printed as “not exercised.”

If the system has detected the door bottom sensor, door top sensor, and door center sensor, as not blocked, blocked, and blocked, respectively after you have pressed START; “DOOR CLOSE” is printed as “OK.” Otherwise it is printed as “not exercised.”

Vacuum Test (Zero Shift Test)

The Vacuum test is executed when you press START during the following AutoTest top level display:

**VACUUM TEST w/START
Next(CANCEL)-Exit(CLOSE)**

This procedure tests the functioning of the Vacuum pump. Pressing CLOSE on any of the following displays exits the Vacuum test, vents the chamber, prints the Vacuum test report, and returns to the AutoTest top level menu shown above. If START is pressed during the above display, the display changes to the following.

**CONNECT BARATRON TO VAC
Continue w/START**

While the above message is displayed, the test is paused to allow you to connect a Baratron. When START is pressed during the above display, the chamber door closes and the following is displayed:

DOOR CLOSES AUTOMATICALLY

If the door fails to close due to being blocked (the door center sensor is activated before the door top sensor), the following is displayed:

DOOR IS BLOCKED
Exit w/CLOSE

If the door fails to close because of a close door time-out (door top and center sensors not activated within 15 sec. of beginning to close), the following is displayed:

CLOSE DOOR TIME-OUT
Exit w/CLOSE

If the door fails to close due to and over center time-out (door top sensor activated, but door center sensor not activated within 15 seconds of beginning to close), the following is displayed:

OVER CENTER TIME-OUT
Exit w/CLOSE

If any of the above error conditions occur, you can press CLOSE, to return to the AutoTest top level display for the Vacuum test.

If none of the above error conditions occurs, and the door closes successfully, the system prepares to pump the chamber down from atmospheric pressure by closing the throttle valve, and displays the following on the LCD, while the throttle valve is closing.

CLOSING THROTTLE VALVE
PLEASE WAIT...

Once the throttle valve is closed, the vacuum pump turns on, the throttle valve opens, and the following is displayed:

VAC. AT XX SEC 30.0 M
PRESS = XXXXX YY.Y M

XX is the number of seconds elapsed before the vacuum switch activates. This field updates each second until the vacuum switch trips. **YY.Y** represents the number of minutes elapsed into the Vacuum test. **XXXXX** is the chamber pressure. (Pressure units of Torr or Pascals are user selectable.) **XXXXX** and **YY.Y** update continuously during the Vacuum test.

If the vacuum switch does not trip within 60 seconds of beginning pump down, a phase rotation error is assumed, and the Vacuum test exits, and the following is displayed.

**EXITING VACUUM TEST
PHASE ROTATION ERROR**

The following message is printed in red in lieu of a Vacuum test report:

PHASE ROTATION ERROR

If the vacuum switch trips within 60 seconds, pump down continues (if not interrupted by Pressing CLOSE) for 30 minutes. After this time period, or if CLOSE is pressed prior to 30 minutes, the Vacuum test exits, displays the following on the LCD, vents the chamber, and prints the Vacuum test report showing number of seconds elapsed from the beginning of pump down until the vacuum switch tripped, the minimum pressure detected, and the number of minutes elapsed from the beginning of pump down until the Vacuum test exited.

After the chamber has returned to atmospheric pressure, and the Vacuum test report has printed, the chamber door opens, and the AutoTest top level menu is displayed.

Injection Test

Press START at the AutoTest top level menu to begin the injection test.

**INJECTION TEST w/START
Next(CANCEL)-Exit(CLOSE)**

You are prompted to insert a cassette if needed. If a cassette is present, it ejects towards the chute, while the following is displayed:

**INJECTION TEST SETUP
WAIT FOR CASSETTE EJECT**

You can toggle extension or retraction of the auto-feeder arm with OPEN if necessary.

If CLOSE (or CANCEL) is pressed, the display returns to the initial Injection test message. The following sequence of events continues as long as cassettes are delivered:

If on the first pass over the barcode, any error condition is detected the following message is displayed and the cassette returns to the front in preparation to read the barcode a second time.

**VERIFYING CASSETTE
PLEASE WAIT...**

If any of the following error conditions occur during the barcode read, the system ejects the cassette towards the cassette collection box, displays the corresponding error messages, prints the error message in red, prints a barcode header, and signals the auto cassette feeder to insert the next cassette.

If the cassette is not ejected within 20 seconds (most likely due to a mechanical failure such as a cassette jam), an eject time out occurs, and the Injection test is terminated.

If the barcode is acceptable, it indexes to the first slot. While indexing to the first slot, the following is displayed::

POSITIONING CASSETTE...

If indexing was successful, the system extends the injector cam and clamps the cassette for approximately one minute. The following message is displayed and the same information is printed:

PROCESSING CASSETTE Cell Number XX

XX is the number of available cells, progressing from 1 to 10. After one minute, the system retracts the injector cam, and after 10 seconds, indexes to the next cell. The indexing procedure is repeated for the remaining slots.

If the barcode read was successful, the barcode information is printed indicating the parity bit, the cassette type, the binary expiration information and the date in month and year.

If the barcode read was not successful, the system prints the same message without the barcode information, to indicate that the barcode read was attempted but failed.

The cassette is ejected to the cassette collection box, and the a message is displayed requesting insertion of the next cassette.

Exit Injection Test

After each cassette is ejected, the following messages is displayed on the LCD until the next cassette is inserted:

INSERT EMPTY CASSETTE
Exit w/CLOSE

You can terminate the Injection test at any time by pressing CLOSE (or CANCEL), or you can continue to feed additional cassettes.

If you press either CLOSE or CANCEL “EXIT INJECTION TEST” is printed and the following message is displayed.

PRINTING REPORT
PLEASE WAIT...

After printing, if a cassette is in place, the following message is displayed while the cassette is ejected towards the cassette collection box:

EXITING INJECTION TEST
WAIT FOR CASSETTE EJECT

After the cassette has been ejected, the display returns to the initial Injection test display.

Slot Test

The Slot test is executed by pressing START during the following AutoTest top level menu display.

SLOT TEST w/START
Next(CANCEL)-Exit(CLOSE)

If a cassette has been inserted, it ejects toward the front panel, and the following is displayed as the cassette is being ejected.

SLOT TEST SETUP
WAIT FOR CASSETTE EJECT

If the cassette disengages from the cassette roller, and the cassette sensor is still seeing white, the following is displayed message, until the cassette is removed.

PLEASE REMOVE CASSETTE

Once the existing cassette is ejected and removed, the following is displayed.

**STOP TEST AT CELL# XX
OPEN(chng)-CLOSE(accept)**

In this display, you have the opportunity to halt the slot test when the cassette is positioned at the cell specified by **XX** below. You can enter any value from 1..10 for **XX** for the Total Machine Cycles. If no value is entered, the Slot test, on completion, ejects the entered cassette towards the front panel.

If a value in the range 1-10 has been entered, the Slot Test halts processing when the cassette is positioned at the entered cell, and does not eject the cassette. (The cassette remains installed in this position, after AutoTest exits.) Press CANCEL to move on to the next display. This display is the only Slot test display on which CLOSE does not exit the Slot test.

During the next display you are prompted to enter a cassette.

INSERT CASSETTE

The inserted cassette is captured, and moved to the end of the barcode, and the following is displayed:

**SLOT EDGES w/START
Exit w/CLOSE**

If you press START during this display, the slot test begins by indexing to the first slot, and displays the following on the LCD.

**PROCESSING CASSETTE
INDEXING...**

When the cassette is positioned at the first slot, the LCD changes to the following, with **XX** = 1. The cassette remains positioned at the current slot for approximately 5 seconds before being indexed the next slot. While the cassette is being indexed, the above is displayed, and while the cassette is positioned at a given cell, the following is displayed, with XX equal to the number of the current cassette slot. The cassette processing continues in this fashion, until the cassette is positioned at the specified slot, or if no “stop at” slot has been specified, until 10 slots have been processed.

**PROCESSING CASSETTE
Cell Number XX**

Once the cassette processing is completed, the display changes to the following:

**PRINTING REPORT
PLEASE WAIT...**

After the Slot test report has printed, if you have not specified a “stop at” slot, the cassette ejects towards the front panel. (If you have indicated a “stop at” slot, the LCD returns the AutoTest top level display for the Slot test.) While the cassette is being ejected, the following is displayed.

**EXITING SLOT TEST
WAIT FOR CASSETTE EJECT**

If the cassette disengages from the cassette roller, while the sensor is still sensing white, the following is displayed, until you removes the cassette.

PLEASE REMOVE CASSETTE

Once the cassette is removed, the LCD displays the AutoTest top level menu for the Slot test. The slot test report is printed indicating the number of cells indexed.

AutoTest Final Report

If CLOSE is pressed during any AutoTest top level display, and at least one test has been completed, the AutoTest final report is printed. Tests that have been completed, are designated “complete,” otherwise the designation is “not complete.” Once this report is printed, and AutoTest has exited to the main system software, test completion status is reset for all tests to “not complete.”

✓ Note: *The two types of vacuum switches used on the STERRAD Systems are Whitman vacuum switch or the SMC vacuum switch. If only one of the vacuum switch tests is exercised, that test is included in the report. If both or none of the vacuum switch tests are exercised, both tests are included in the report.*

Operator Accessible Edit Mode

The STERRAD 100S Sterilizer has a different style edit mode than the STERRAD 100 Sterilizer. It is access the same way as shown in the STERRAD 100/100S Service Guide, but there are more options. The STERRAD User’s Guides have the latest information on using the edit mode.

When CANCEL and START are pressed simultaneously while in Idle state, the system enters the main Edit mode. This mode allows you to perform the following operations:

- Set the correct date
- Set the correct time
- Choose a clock mode of 12 or 24 hours
- Choose pressure units - Torr or Pascals
- Print a history of the last 10 cycle cancellations
- Print a history of the last 10 barcode read failures
- Print a history of the RF reflected power level

Printout Information

The system printout generated by the operator edit mode, contains the following data:

- **PM DATA** is the planned maintenance history which is printed only if the PM History has been updated in the current edit mode session
- **DDD** is the day of the week
- **MM/DD/YY HH:MM:SS** are the current date and time: MM = month, DD = day, YY = year, HH = hours, MM = minutes, SS = seconds.
- **LLL** is the language code; e.g., ENG for English;
- **XXXX YYYY ZZZZXXXX** is a hexadecimal number representing the language-section check sum and YYYY is a hexadecimal number representing the code-section check sum. ZZZZ is a hexadecimal number representing the “total” check sum (ZZZZ = XXXX + YYYY) of the EPROM in U14. This is same as the number printed on the EPROM label.
- **WWWW** is the checksum of the EPROM in U15.
- **CC-SSSSS-I-VVVR** is the software part number
- **MM-DD-YY** is the software build date.

Autorestart Process

If during the first injection stage of the short cycle, the pressure during the first 10 seconds does not increase to more than 420 mtorr, or if the injection system interrupted algorithm detects what is believed to be an empty cell, and if there are at least 2 cells remaining in the cassette, then the system does the following:

- Retracts the cam and index to the next cell (requires short wait for cam to retract).
- If the chamber pressure is below 1 Torr, the vent valve opens briefly until a pressure of 1 Torr or greater is detected.
- Pumps back down to 400 mTorr (does not vent to atmosphere first).
- Restarts the injection stage

- If either triggering condition is detected in the re-started stage, it cancels the cycle.
- If there are not 2 cells remaining in the cassette when the cycle would otherwise restart, the cycle is cancelled.
- If Injection System Interrupt is the cause of the restart, and is detected during the re-started stage, then the cassette is ejected.
- AUTO-RESTART PERFORMED is printed with the reason for the restart. This message is printed whether the restarted stage is successful.

Short Cycle

The cycle selection menu allows you to select a LONG or SHORT cycle. The default cycle, which is set in the Edit Menu, appears as first menu item.

For STERRAD 100 Systems, the test cycle is a special short cycle with a diffusion time of 2 minutes instead of 44 minutes. For STERRAD 100S Systems, the test cycle is the same as the first half of the short cycle, with final vent occurring after the first plasma stage.

Cycle Times

The vacuum time for the STERRAD 100S System is 26 minutes for the long cycle (international only) and 21 for the short cycle.

When the chamber pressure reaches 700 mTorr, while being pumped down from atmospheric pressure to 500 mTorr, plasma is lit. The plasma stays lit at a controlled pressure of 500 mTorr to condition the load for sterilization. The duration of this pre-conditioning period is 15 minutes for the long cycle (international only), or 10 minutes for the short cycle. The vent valve is opened following the plasma conditioning, returning the chamber to atmospheric pressure. Finally, the chamber pressure is pumped down to 400 mTorr before transitioning to the injection stage.

During diffusion, the vent valve is opened to allow the chamber to reach atmospheric pressure. The diffusion stage continues for 10 minutes in the long cycle (international only), and for 2 minutes in the short cycle.

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If the default is SHORT cycle, then the following is displayed:

SHORT CYCLE
YES(START) – NO(CANCEL)

Else, if the default is LONG cycle, then the LCD will show:

LONG CYCLE
YES(START) – NO(CANCEL)

Press START for the default cycle.

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While the LCD is showing the default cycle in the cycle selection menu, press CANCEL to select the other (non-default) cycle.

Pressing CANCEL when the default is SHORT changes the display:

LONG CYCLE
YES(START) – NO(CANCEL)

If the default is the LONG CYCLE, then the following is displayed:

SHORT CYCLE
YES(START) – NO(CANCEL)

Press START to start the cycle displayed..

While the LCD is showing the non-default cycle in the cycle selection menu, press CANCEL to exit the cycle selection menu.

When START is pressed, the cycle starts if the door and chamber are at the appropriate temperature. If the temperature is not high enough to start sterilization, the following is displayed:

**WARMING UP, CYCLE WILL
START AUTOMATICALLY**

When the temperature reaches 42° C, then the previously selected cycle starts automatically. Press OPEN, when this message is displayed, to open the chamber door cancel the pending cycle.